SE WIPT Brief

An Overview of Technical Planning and Systems Engineering Plan (SEP) Development

Systems and Software Engineering
Office of the Deputy Under Secretary of Defense
for Acquisition and Technology,
ODUSD(A&T)

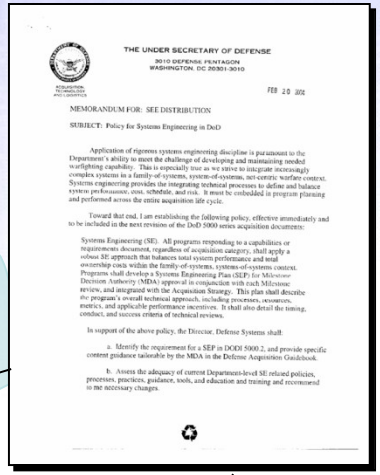
Outline

- SE and SEP Policy and Purpose
- Systems Engineering Working Integrated Product Teams (SE WIPTs)
- Relevant Guidance and Training
- Top-Level SEP Preparation Thoughts

USD(AT&L) Systems Engineering Plan (SEP) Policy*

- "Provide a context within which I can make decisions about individual programs."
- "Achieve credibility and effectiveness in the acquisition and logistics support processes."
- "Help drive good *systems engineering* practices back into the way we do business."

Programs shall develop a Systems Engineering Plan (SEP) for Milestone Decision Authority (MDA) approval in conjunction with each Milestone review, and integrated with the Acquisition Strategy. This plan shall describe the program's overall technical approach, including processes, resources, metrics, and applicable performance incentives. It shall also detail the timing, conduct, and success criteria of technical reviews.



THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

FEB 20 2004

MEMORANDUM FOR: SEE DISTRIBUTION

SUBJECT: Policy for Systems Engineering in DoD

Application of rigorous systems engineering discipline is paramount to the Department's ability to meet the challenge of developing and maintaining needed warfighting capability. This is especially true as we strive to integrate increasingly complex systems in a family-of-systems, system-of-systems, net-centric warfare context. Systems engineering provides the integrating technical processes to define and balance system performance, cost, schedule, and risk. It must be embedded in program planning and performed across the entire acquisition life cycle.

Toward that end, I am establishing the following policy, effective immediately and to be included in the next revision of the DoD 5000 series acquisition documents:

Systems Engineering (SE). All programs responding to a capabilities or requirements document, regardless of acquisition category, shall apply a robust SE approach that balances total system performance and total ownership costs within the family-of-systems, systems-of-systems context. Programs shall develop a Systems Engineering Plan (SEP) for Milestone Decision Authority (MDA) approval in conjunction with each Milestone review, and integrated with the Acquisition Strategy. This plan shall describe the program's overall technical approach, including processes, resources, metrics, and applicable performance incentives. It shall also detail the timing, conduct, and success criteria of technical reviews.

In support of the above policy, the Director, Defense Systems shall:

a. Identify the requirement for a SEP in DOD 5000.2, and provide specific content guidance tailorable by the MDA in the Defense Acquisition Guidebook.

b. Assess the adequacy of current Department-level SE related policies, processes, practices, guidance, tools, and education and training and recommend to me necessary changes.

Top Five SE Issues*

- Top 5 SE issues for 2006 identified by NDIA task group, not necessarily in priority order, includes:
  - Key SE practices known to be effective are not consistently applied across all phases of the program life cycle.
  - Insufficient SE is applied early in program life cycle, compromising foundation for initial requirements and architecture development.
  - Requirements are not always well-managed, including effective translation from capabilities statements into executable requirements to achieve successful acquisition programs.
  - Quantity and quality of SE expertise is insufficient to meet demands of government and defense industry.
  - Collaborative environments, including SE tools, are inadequate to effectively execute SE at joint capability, system of systems (SoS), and system levels.
- Significant note: issues relative to evolving acquisition strategies and environments (capabilities, environments, Systems-of-Systems (SoS)) were also a common theme. Although task group ultimately decided to capture these aspects as comments distributed across above 5 major issues, SoS issues are significant and in aggregate could be considered a “6th issue” added to this list.

Purpose of Policy and SE Planning*

- Systems Engineering is
  - Overarching process applies to transition from stated capability need to operationally effective and suitable system throughout life cycle of system
  - Integrating mechanism for balanced solutions addressing capability needs, design considerations and constraints, as well as limitations imposed by technology, budget, and schedule
  - Integrating mechanism across technical efforts related to development, manufacturing, verification, deployment, operations, support, disposal of, and user training for systems and their life cycle processes
  - Offers technical framework to enable sound decision making relative to trade studies across system performance, risk, cost, and schedule
- Successful implementation of proven, disciplined SE processes results in total system solution that is--
  - Robust to changing technical, production, and operating environments;
  - Adaptive to needs of user; and
  - Balanced among multiple requirements, design considerations, design constraints, and program budgets.

"Plans are nothing; planning is everything." – Dwight D. Eisenhower

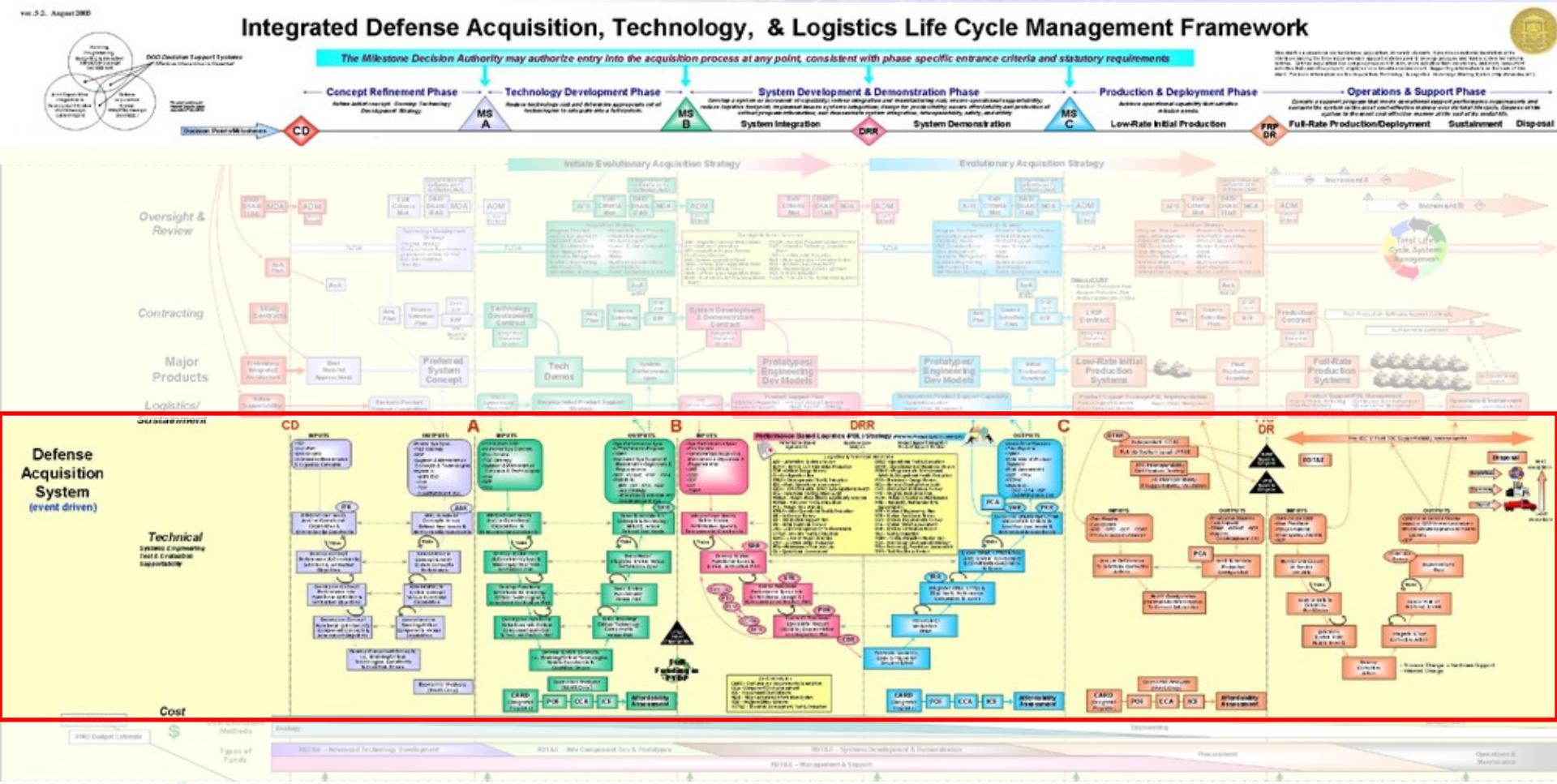
*Ref: DAG, Ch. 4.4

USD(AT&L) SEP Purpose

- The SEP
  - Captures integration of both government and contractor technical planning activities, roles, and responsibilities over the acquisition and sustainment life cycle
  - Provides expected management interactions and impacts of their respective processes not only by addressing program-tailored processes, but also the "who, when, and to what result(s)“
  - Articulates and communicates technical planning and management approach to program team, stakeholders, and contractor teams (including bidders if provided with Request for Proposal (RFP))
  - Can set expectations for contractors in solicitation
- Independent program assessments and OSD Program Support Reviews (PSRs) use SEP to gauge how well program is executing its technical plan
- OSD reviews SEP for technical planning adequacy and consistency with other key program planning documents

The SEP is the PM’s technical management tool and empowers the Lead Systems Engineer/Chief Systems Engineer (LSE/CSE) to execute the program’s technical approach

SE Applied to Acquisition*



For more details on framework, go to https://akss.dau.mil/ifc/

SE WIPT

- To be effective, an SE WIPT (like all WIPTs) requires:
  - Full support of PM and LSE
  - Charter defining goals, products, membership and reporting requirements
- The SE WIPT (similar to a Test & Evaluation (T&E) WIPT) should:
  - Prepare program's SEP to reflect program office and contractor's technical planning
  - Assist LSE in establishing event-driven life cycle technical planning
  - Assist technical authority in assessing:
    - Schedule and cost realism,
    - Readiness to proceed to SE technical reviews,
    - User's requirement documents (e.g., Initial Capabilities Document (ICD), Capabilities Description Document (CDD), CPD (Capabilities Production Document))
    - Production and sustainment planning, etc.
  - Focus on identifying and resolving issues early by providing continuous assessments and analyses to PM and functional supervisors
  - Assess progress to achieving performance requirements and acquisition phase exit criteria to ensure program execution in accordance with approved SEP
  - Review system and Family of Systems (FoS)/ SoS performance

The SE WIPT is the PM's mechanism for early scoping of required technical effort and continuous monitoring of technical activities

SE WIPT Charter Sample

Program Y IPT Charter		
Charter Statement	**We accept total system performance and integration responsibility for the product that satisfies all SDD and production affordability/risk objectives and satisfies the product's performance requirements.**	
Key Responsibilities	**•Deliver all products within program/customer performance cost and schedule requirements •Provide IPT program management functions, including personnel supervision, technical management, subcontract management and business management for all development and production activities of the team •Develop and execute detailed specifications, plans and schedules including IMP/IMS for all team task and product deliveries •Manage performance through EVMS, TPMs and other metrics and risk assessments •Implement team SE and quality standards, thus ensuring**	
Key Products and Deliverables	**•SDD product – this should be "Functional, Allocated, and Product Baselines" •LRIP Configuration •IMP/IMS •Integrated Product Development and Manufacturing Plan •Verification Plan •Maintainability Demonstration**	**•Supportability Demonstration •SDD Test Package •DT&E Package •OT&E Package •Modeling and Simulation •Trade Studies •Block Plan (as appropriate)**
Key Team	**•Program Office •Chief/Lead Systems Engineer**	**•DCMA Representative •Security Representative**

SE WIPT Participants

- Recommended Participants – Are the right people involved?
  - PM
  - Program's LSE/CSE
  - Program's IPT Leads (e.g. Sustainment, Testing, etc.) or SEs, if so staffed
  - Contractor LSE and IPT Lead counterparts, as appropriate
  - Office of the Secretary of Defense (OSD) Representatives
    - Systems and Software Engineering
    - Logistics and Maintenance Readiness
    - Etc.
  - PEO-level LSE
  - Service-level LSE

Involving the right people in the program's technical planning ensures that all life cycle interests are addressed as early as possible

SE WIPT Planning Guidelines

- Homework
  - Are SE WIPT participants sufficiently knowledgeable of acquisition and SE policies, related references, guidance, and training?
  - Do planning participants understand SEP purpose? (Remember, the SEP captures, integrates, and communicates both government and contractor technical planning.)
  - Are participants sufficiently knowledgeable of program goals *and* constraints?
  - Are reference documents available to the planning team?
    - Appropriate programmatic information for current acquisition phase; any drafts of programmatic information for upcoming phase
    - Technology Development Strategy (TDS) and/or AS
    - Requirements documents (e.g. ICD, CDD, and CPD)
    - Concept of Operations (ConOps)/Concept of Employment (ConEMP)
    - Technical and programmatic results of previous phases, as applicable

Available Systems Engineering Planning References and Related Guidance*

- Defense Acquisition Guidebook (DAG)
  - Chapter 4 – Systems Engineering
  - Chapter 5 – Acquisition Logistics
  - Chapter 9 – Test and Evaluation
- SEP Preparation Guide (currently v2.0)
- “SE WIPT” brief
- Integrating Systems Engineering into Acquisition Contracting
- Risk Management Guide for DoD Acquisition
- SoS Systems Engineering Guide: Considerations for Systems Engineering in a System of Systems Environment (v 0.9)
- Reliability and Maintainability Guide
- IMP/IMS Guide

*For more on references and guidance, go to

Available DAU Systems Engineering Planning and Related Training

- Education, training, and experience certification standards for DoD SE revitalization are reflected in current Systems Planning, Research Development, and Engineering (SPRDE) Career Field/Systems Engineering (SE) and Program Systems Engineer (PSE) Career Paths
  - SPRDE Core Courses*
    - SYS 101 (Online)
    - SYS 202 (Online)
    - SYS 203 (Classroom)
    - SYS 302 (Classroom)
  - Continuous Learning Modules (Online)
    - CLE-003 Technical Reviews
    - CLE-009 Systems Safety in Systems Engineering
    - CLE-011 M&S in Systems Engineering
    - CLE-017 Technical Planning
    - CLE-301 Reliability and Maintainability
    - CLM–017 Risk Management

*For more on DAU SPRDE courses, visit http://www.dau.mil/schedules/schedule.asp?

Other Training and Resources

- Other online training
  - CLE 001 Value Engineering
  - CLE 013 Modular Open Systems Approach to DoD Acquisition
  - CLE 036 ECPs for Engineer
  - CLE 038 Corrosion Prevention and Control Overview
  - CLM 021 Introduction to Reducing Total Ownership Costs R-TOC
- Other Web-based Resources
  - SE Community of Practice sponsored by AT&L found at http://acc.dau.mil/se
  - Best Practices Clearinghouse found at https://bpch.dau.mil/

Top-Level SEP Preparation Thoughts

- The SEP
  - Should be a “go to” technical planning tool referred to and updated as needed. *This should be provided to any new engineers on the team.*
  - Be “living” vice “shelf-ware”
  - Be *specific* to the program and use “plain text” to describe what the program is planning to do. *Often, SEPs are generic in nature (e.g. Risk Management 101) and do not differentiate themselves from other programs; are descriptions vice plans*
  - Should not only describe *specific* program approaches and products, but also how the SE approach is actually implemented (e.g. with flowcharts, involved team members including the LSE, timing, etc.)
  - Be consistent with and perhaps drive other program documentation
  - Should be unclassified, but may be classified as appropriate

The SEP *must* be specific to each program

Top-Level SEP Preparation Thoughts (cont'd)

- There is no mandatory SEP format *or* page count - Content *is* more important than format. *However, if starting from scratch, the* SEP Prep Guide *provides a sample Table of Contents to get you started.*
- When submitting SEP for OSD-level review, provide with either accessible electronic links and/or a CD with documents referenced in the SEP. *Often the SEP review team needs to refer to the references as the SEP may not provide enough details.*
- Consider the following appendices to accommodate additional information or oft changing details:
  - Acronym list
  - Current technical risks – these help to understand rationale for technical approach
  - Initial WBS (e.g. to level 3 as typically used for RFPs) – to illustrate requirements decomposition
  - IPT Charters, especially for SE WIPT or SEIT
  - References table

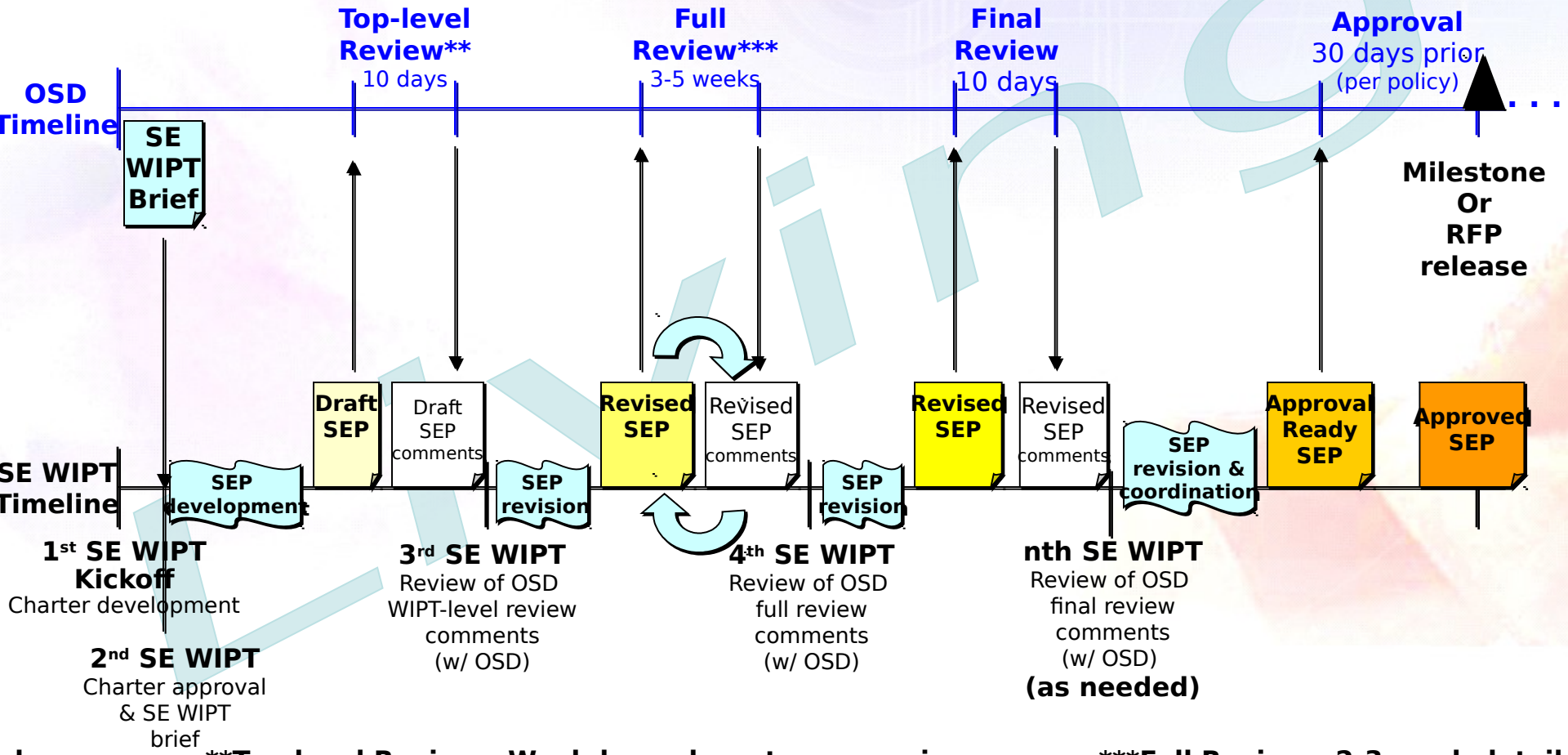
Best practice:
Use charts, figures, tables, and graphics to avoid confusing text

OSD SEP Review Levels

- Working-Level (Top-level/Quicklook)
  - Action Officer/Early draft version with SEP not necessarily signed by anyone
  - Approximately a 10-calendar-day turn-around time
  - Results in an email from SSE/AS Program Support Team Lead (PSTL) to review requester with bulleted high-level comments – to be discussed in an SE WIPT shortly thereafter to ensure understanding and expectations
- Draft (Full review)
  - Program office close-to-final version with SEP not necessarily signed by anyone
  - 3-5 calendar week turn-around time
  - Results in an email with formal comments, recommendations, and rationale attached – again, to be discussed in an SE WIPT shortly thereafter to ensure understanding and expectations
- Approval (Abbreviated review of adjudicated comments unless this is first submittal; then Full review required)
  - Final version signed at Component Level (Cannot be approved without this signature)
  - 2-5 calendar week turn-around time – Depends on whether SEP submitted:
    - Was worked in an SE WIPT with OSD participation
    - Has gone through a full review at least once or not
    - Includes matrix with how full review comments were adjudicated and location within document
  - Results in a MDA-signed approval memo and SEP

OSD-level SEP reviews can be quicker if OSD is involved in SE WIPT

SEP Development Timeline*



ale **Top-level Review: Week-long showstopper review ***Full Review: 2-3 week detail

Critical Comments

- At a minimum, there are four (4) areas where a SEP can receive a critical comment (areas which violate SE and SEP policy):
  - Detailed and tailored SE approach to include the Technical Baseline Approach*
  - Event-driven Technical Reviews*
  - SE Integration with IPTs*
  - Program-independent SME's will participate in a program's technical reviews**

*From "Implementing Systems Engineering Plans in DoD – Interim Guidance" memo dated March 30, 2004
**From "Policy Addendum for Systems Engineering" memo dated October 22, 2004

Address these critical areas and the focus areas within the SEP Prep Guide and you are on your way to a quality SEP

Summary

- SE and SEP Policy, Guidance, and Training exists to “Help drive good systems engineering practices back into the way we do business.”
- SE is integrating mechanism across technical efforts related to development, manufacturing, verification, deployment, operations, support, disposal of, and user training for systems and their life cycle processes
- Holding early and often SE WIPT meetings with OSD participation is highly encouraged
- The SEP
  - Captures and integrates both government and contractor technical planning for program over entire acquisition and sustainment life cycle
  - Provides expected management interactions and impacts of their respective processes not only by detailing program-tailored processes, but also by including "who, when, and to what result(s)“
  - Empowers LSE/CSE to execute program’s technical approach
  - Is PM’s technical management tool

SEP Bloopers

- **"Task analyses conducted by *human and engineers* provide qualitative data to support …."**
- **"Fifteen (15) trade studies are planned during the SDD phase. These trade studies are undefined at this time."**
- **"Integrity is not an issue on the {Program}, because the program was put on contract during acquisition reform."**
- **"The … Program Manager and Systems Engineer monitor integration activities to ensure that the KPPs and the KSAs are *not* achieved."**
- **"The …communications are intended to support both the internal communications capabilities and external interfaces between the {Program} and *the rest of the world*."**
- **"The current program office Chief Engineer and IPT leads will thus be dual *hated* to support future development …"**

For More Information

- Contact SSE Assessments & Support at 703-602-0851 or atl-as@osd.mil